

ICI-5 Bifocal Flight Opportunity

Completed Technology Project (2018 - 2020)



Project Introduction

We propose a flight of opportunity for a next-generation electron sensor on a Norwegian sounding rocket. The Bifocal sensor, currently under development with support from the H-TIDeS program, is a low-resource instrument that will provide both routine survey measurements of the electron distribution and targeted high-resolution measurements of the electron distribution from a single integrated payload. The Bifocal high-resolution mode utilizes a combination of deflecting electrostatic optics and a multi-element imaging anode to make very high cadence and angular resolution measurements of electron distributions. The H-TIDeS program is currently supporting the prototyping and testing of the Bifocal optics, detector, and front-end electronics, with prototype versions of all hardware complete by the first quarter of 2018. Meanwhile, a Norwegian sounding rocket flight, the Investigation of Cusp Irregularities 5 (ICI-5) mission, part of the ten-rocket Grand Challenge Initiative Cusp Project, needs an electron sensor to measure soft electron precipitation into the cusp ionosphere. The ICI-5 mission, slated to launch from Svalbard, Norway in January 2019, presents an ideal test flight opportunity for the Bifocal sensor. The goal of the ICI-5 mission is to understand ionospheric irregularities, associated plasma instabilities and turbulence, and the role of soft electrons in their formation and evolution. The Bifocal high-cadence measurements of soft electron precipitation, in concert with multi-axis electric field measurements, combined with multi-point measurements from a dozen daughter payloads measuring plasma density, will allow us to make significant scientific process in understanding the multi-scale evolution of ionospheric irregularities and their connection to soft electron precipitation. Ionospheric irregularities have a major effect on our society by disrupting communication with spaceborne assets such as GPS and GNSS. This mission therefore promises an advance in our understanding of an important scientific topic with significant societal importance. In order to support this flight, we propose to make minor adaptations to the high-heritage interface electronics and low-voltage and high-voltage power supplies developed at Iowa for previous generations of electron electrostatic analyzers flown on the Thunderstorm-III, AT I-II, RACE, HiBAR, ACES, CHARM-II sounding rockets, and integrate those electronics with the Bifocal front-end electronics, detector, and optics. The result will be a fully functional advanced electron instrument well suited to the ICI-5 science goals, which will help answer important questions about plasma microphysics and turbulence in the cusp ionosphere. This test flight will also serve to qualify the Bifocal sensor, thereby demonstrating key enabling technologies for future NASA heliophysics missions.



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Organization:

University of Iowa

Responsible Program:

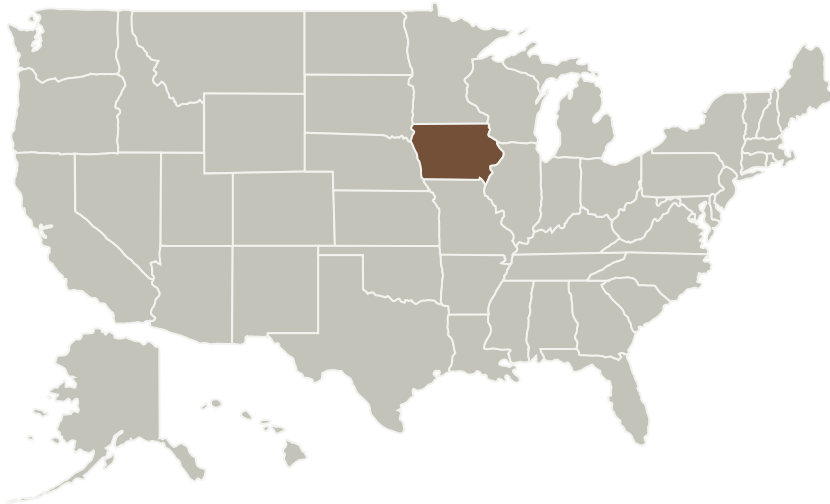
Heliophysics Technology and Instrument Development for Science

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
University of Iowa	Lead Organization	Academia	Iowa City, Iowa
University of Oslo	Supporting Organization	Academia	

Primary U.S. Work Locations

Iowa

Project Management

Program Director:

Roshanak Hakimzadeh

Program Manager:

Roshanak Hakimzadeh

Principal Investigator:

Jasper S Halekas

Co-Investigators:

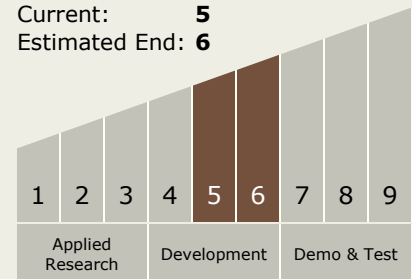
Craig A Kletzing

Lynn Hudachek

Joran Moen

Technology Maturity (TRL)

Start: 5
 Current: 5
 Estimated End: 6



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.3 In-Situ Instruments and Sensors
 - TX08.3.1 Field and Particle Detectors

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Target Destination

The Sun